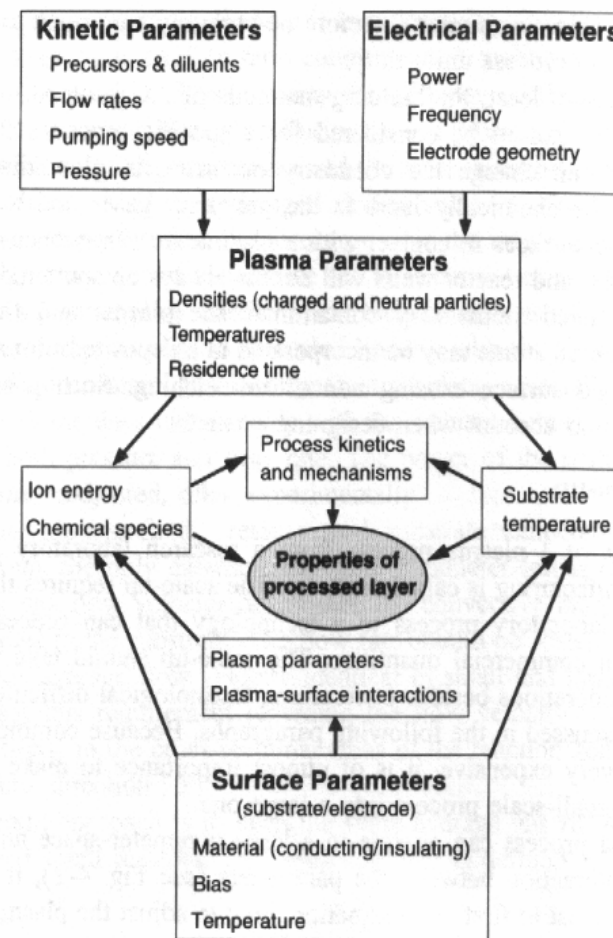


**Chapter V:**  
**Plasmas for surface treatments:**  
**Important things**

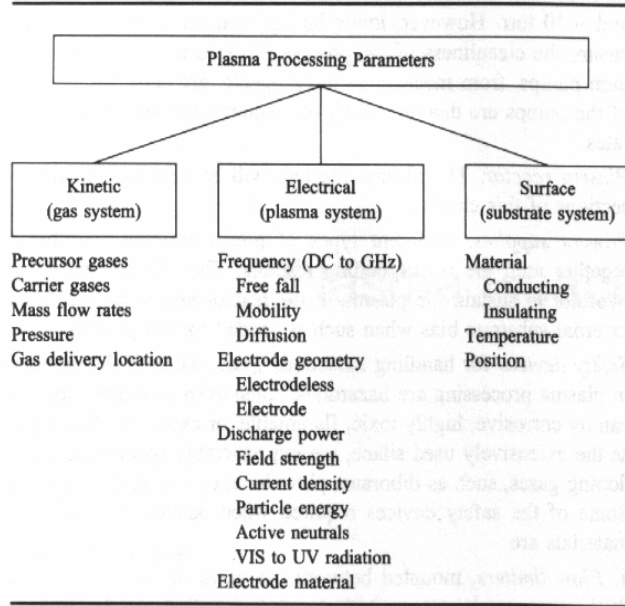
**Plasmas for surface treatments:**  
**Important things**



**Fig. 4-2** Complexity of interaction between plasma variables (after [3], reprinted with permission). The arrows indicate the possible interactions between process parameters; they do not indicate that all the described interactions always take place.

# Plasmas for surface treatments: Important things

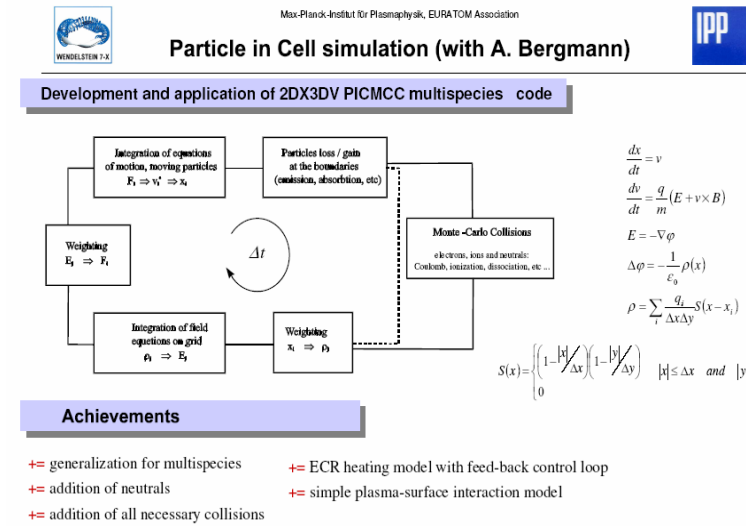
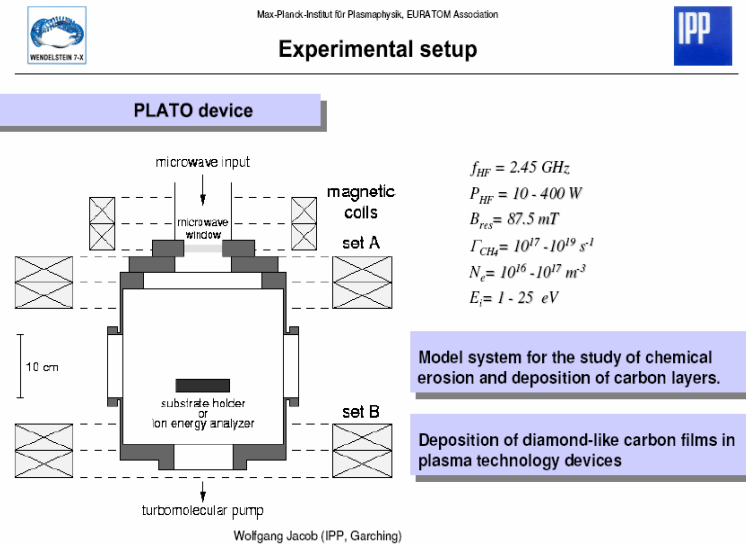
TABLE 4-1 Parameters Controlling Materials Processing by Cold Plasmas (adapted after [2], reprinted with permission)



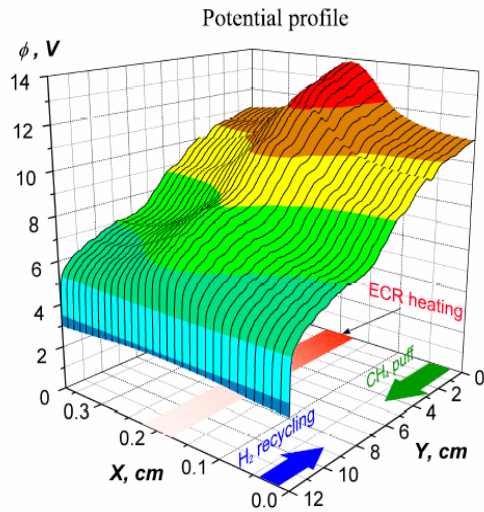
Typical electron densities and temperatures for some plasmas		
Type of plasma	Electron density (cm <sup>-3</sup> )	Electron Temperature (eV)
Flame	10 <sup>8</sup>	0.2
Fluorescent lights	10 <sup>12</sup>	4
DC glow discharges	10 <sup>10</sup>	2
Magnetron	10 <sup>10</sup>	8
rf_plate discharge	10 <sup>11</sup>	4
ECR	10 <sup>12</sup>	5
Plasma arc	10 <sup>15</sup>	0.1

# Plasmas for surface treatments: Important things

## Example: methane plasma



# Plasmas for surface treatments: Important things



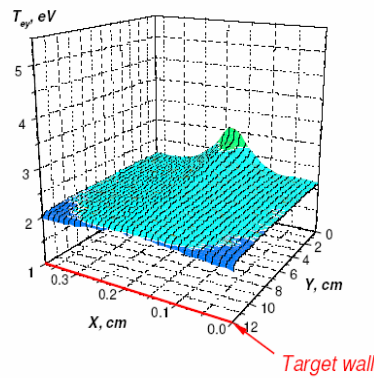
$n_e \sim 10^{10} \text{ cm}^{-3}$   
 $n_n \sim 10^{14} \text{ cm}^{-3}$   
 $P_{HF} \sim 0.01 \text{ W/cm}^2$   
 $B_{min}/B_{max} \sim 0.5$

$\text{CH}_4, \text{CH}_3, \text{CH}_2, \text{CH}, \text{C}, \text{H},$   
 $\text{CH}_4^+, \text{CH}_3^+, \text{CH}_2^+, \text{CH}^+, \text{C}^+,$   
 $\text{H}_2, \text{H}^+, \text{H}_2^+, e^-$   
 Wall recycling

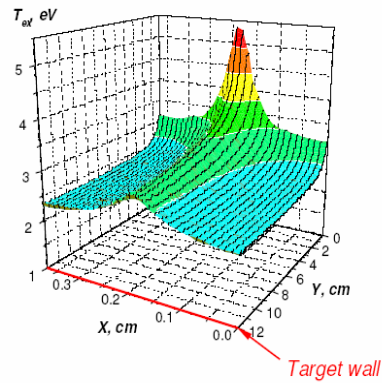
typical calculation speed:  
 $\sim 2.5 \cdot 10^5$  time steps ( $10^{-5}$  s)  
 per day on 32-processor  
 Linux cluster

## Electron temperatures anisotropy

parallel electron temperature

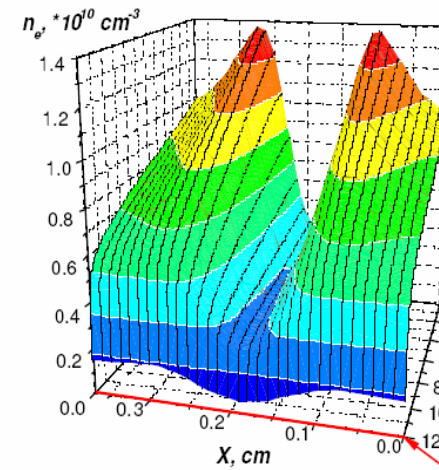


perpendicular electron temperature

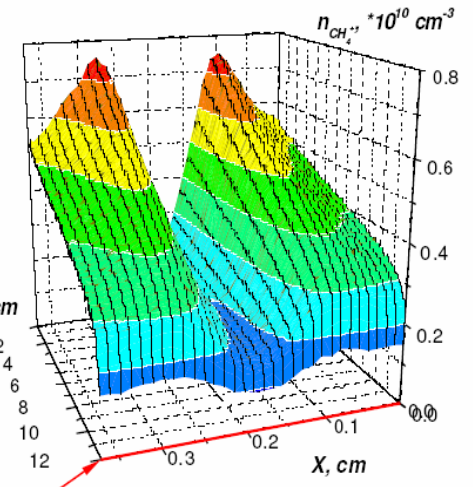


# Plasmas for surface treatments: Important things

electron density



CH4+ density



Target wall